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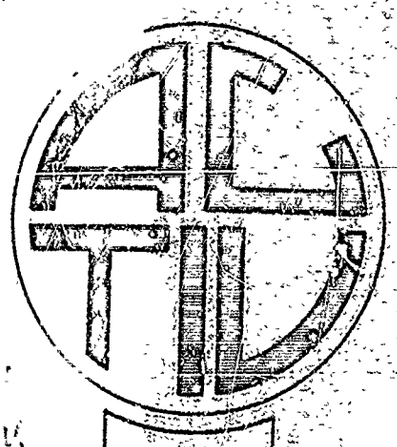

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DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

FINAL REPORT

MARGINAL TERRAIN
ASSAULT BRIDGE-LAUNCHER M113A1
ARMORED PERSONNEL CARRIER

ACTIV Project No. ACG-34/68M

November 1969

Approved:

JOHN E. REID
Colonel, Infantry
Commanding

AVHGC-DST (Nov 69) 1st Ind
SUBJECT: Final Report - Marginal Terrain Assault Bridge - Launcher, M113A1 Armored Personnel Carrier

HEADQUARTERS, UNITED STATES ARMY, VIETNAM, APO SF 96375

TO: Commander in Chief, United States Army, Pacific, ATTN: GPOP-DT, APO SF 96558

1. The attached final report is forwarded for review and transmittal to Department of the Army. Request one copy of the CINCUSARPAC forwarding indorsement be furnished to Commanding General, US Army, Vietnam, ATTN: AVHGC-DST, and Commanding Officer, Army Concept Team in Vietnam (ACTIV).

2. USARV concurs in the conclusions and recommendations of the ACTIV report.

3. Request the development of the second generation MTAB-L be retained under the ENSURE program in order to expedite final delivery to RVN.

FOR THE COMMANDER:

1 Incl
as

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

2 DEC 1969

AVIB-CO

SUBJECT: Final Report - Evaluation of the Marginal Terrain Assualt Bridge-Launcher M113A1 Armored Personnel Carrier

Commanding General
United States Army, Vietnam
ATIN: AVHGC-DST
APO 96375

1. Reference: Letter, AVHGC-DH, Headquarters, US Army, Vietnam, 23 February 1967, subject: Letter of Instruction.

2. In accordance with the provisions of the foregoing reference, the attached final report is forwarded for review and transmittal to Department of the Army.

3. Request one copy of the USARV and CINCUSARPAC forwarding indorsement be furnished the Commanding Officer, Army Concept Team in Vietnam (ACTIV).

FOR THE COMMANDER:

JOSEPH W. STRAUB
Captain, AG
Adjutant

AUTHORITY

Message, 57012, CG USARV, 16 April 1969,
Subject: Marginal Terrain Assault Bridge-Launcher M113A1 Armored Personnel Carrier (U)

ACKNOWLEDGMENTS

The Army Concept Team in Vietnam is indebted to the following for their cooperation and assistance in the conduct of this evaluation:

United States Army Mobility Equipment Command
Customer Assistance Office, Vietnam
1st Infantry Division
4th Infantry Division
9th Infantry Division
25th Infantry Division
Americal Division
11th Armored Cavalry Regiment
199th Light Infantry Brigade

PROJECT OFFICER

Major Eugene B. Rishel III, ADA

EVALUATOR

Captain William T. Harvey, CE

ABSTRACT

The Army Concept Team in Vietnam evaluated the Marginal Terrain Assault Bridge Launcher to determine its suitability in the combat environment of RVN.

The MTAB-L consists of two basic items, a bridge and a launcher both mounted on an M113A1 APC. The bridge consists of two extruded flat aluminum treadway sections which fold at the center. It has no curb system. It is designed to support class 12 loads and has a span of 33 feet. The launcher is welded to the hull of the APC and hydraulically emplaces and detracts the bridge.

The evaluation period started on 3 June 1969 and ended on 10 September 1969. Twenty MTAB-Ls were used in this evaluation. A total of seven units participated in the evaluation and these units were located throughout RVN.

The MTAB-L provided an obstacle crossing capability to the mechanized infantry battalion and the divisional cavalry squadron. By using the MTAB-L, the above units were able to cross the many small streams and canals located in their areas of operations much faster than they had crossed before using field expedient techniques. The evaluation revealed defects in the design and ruggedness of the bridge.

The evaluation concluded that there is a valid requirement for the MTAB-L in RVN and it increases the tactical mobility and flexibility of the mechanized infantry battalions and divisional cavalry squadrons.

From this evaluation, it is recommended that the bridge be made more rugged, a curb system be provided, the class of the bridge be increased and that certain design features be improved.

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SECTION I

INTRODUCTION

1. REFERENCES

a. Message, 18913, COMUSMACV, 2 June 1966, subject: Launcher and Lightweight Assault Bridge for the M113 (U) (MACV-ENSURE 66-13).

b. Message, 779653, DA, 25 August 1966, subject: Launcher and Lightweight Assault Bridge for the M113 (U).

c. Message, 80710, CG USARV, 28 October 1967, subject: Launcher and Lightweight Assault Bridge for M113 (ENSURE #84) (U) (NOTAL).

d. Message, 52313, CG USARV, 26 March 1969, subject: Marginal Terrain Assault Bridge-Launcher M113A1 Armored Personnel Carrier (ENSURE #84).

2. PURPOSE

The purpose of this evaluation was to determine the suitability of the Marginal Terrain Assault Bridge-Launcher M113A1 Armored Personnel Carrier (hereafter called the MTAB-L) for use by United States Army units in the combat environment of the Republic of Vietnam (RVN).

3. OBJECTIVES

a. Objective 1: Evaluate the tactical employment of the MTAB-L in RVN.

b. Objective 2: Evaluate the operational capabilities of the MTAB-L in the combat environment of RVN.

c. Objective 3: Evaluate the maintenance requirements of the MTAB-L in RVN.

d. Objective 4: Determine a basis of issue for each type evaluating unit, if the equipment performs satisfactorily.

4. BACKGROUND

a. Since the advent of increased armored operations by Free World Military Assistance Forces in RVN, a requirement existed for a lightweight bridge mounted on a mechanized vehicle which was compatible with the vehicles used in these type operations. Mechanized operations in RVN were severely hampered by canals, unfordable streams, ditches, destroyed bridges, and bridges which could not be traversed by tracked vehicles. These obstacles forced the tactical commander to accept one of the following solutions:

(1) Continually use the same fording and crossing sites which provided the enemy a tactical advantage by mining these sites.

(2) Resort to antiquated crossing methods such as filling obstacles with logs and debris, blowing paddy dikes, and jumping small streams which required several hours of preparation.

(3) Completely bypass the inaccessible area or travel many kilometers searching for a crossing site.

b. In 1966, the Commander, United States Military Assistance Command, Vietnam submitted an ENSURE to meet the requirement for hasty crossings of small ditches, streams, and canals. The result was the MTAB-L. ENSURE #84 was validated in May 1967. Program delays resulted in a slippage in planned schedules. Twenty MTAB-Ls arrived in RVN in May 1969.

5. SCOPE

All systems were assigned to mechanized or cavalry units. The evaluation was conducted on a non-interference basis with the assigned missions of the evaluating units. The vehicle was used under combat conditions at the discretion of the commander.

6. DESCRIPTION OF EQUIPMENT

The MTAB-L consists of two basic items, a bridge and a launcher, both mounted on an M113A1 Armored Personnel Carrier (APC). The bridge consists of two extruded flat aluminum treadway sections which fold at the center. It has no curbs. It is designed to support Class 12 loads and has a span of 33 feet. The bridge is carried in a fully retracted position on top of the APC and emplaced hydraulically by the launcher. It is designed to be emplaced with or without exposing personnel. The launcher is welded to the hull of the APC. After manual hook-up of two hydraulic connections, the bridge can be retrieved from either end. A combat ready system weighs approximately 25,980 pounds and can be operated by a 4-man crew. Swimming and ground mobility characteristics, with the bridge in travel position, are generally similar to the M113A1.

7. APPROACH

Twenty MTAB-Ls were assigned as follows:

1st Infantry Division	2
4th Infantry Division	2
9th Infantry Division	4
25th Infantry Division	4
Americal Division	2
199th Light Infantry Bde	2
11th Armored Cavalry Regiment	4

The evaluation was conducted from 3 June to 10 September 1969. Four days of driver, operator, and maintenance training was conducted in each unit by a new equipment training team (NETT). This team was composed of two technical representatives from the United States Army Mobility Equipment Command. The APC/launchers were deprocessed and the bridges were assembled by unit personnel under supervision of the NETT. At the conclusion of training, each operator had participated in a minimum of ten launchings and retractions.

8. ENVIRONMENT

The evaluation was conducted throughout RVN. Figure 1 depicts the unit locations and geomorphic provinces in which the units conducted combat operations with the MTAB-L. Weather conditions during the evaluation were characterized by the southwest monsoon. The Mekong Delta, Mekong Terrace, and Western Plateau provinces had frequent rain. The Northeastern Coastlands were relatively dry during the evaluation period.

9. DATA COLLECTION AND ANALYSIS

Data was collected through questionnaires and personal interviews with commanders, staff officers, operating personnel, and NETT personnel. The operating personnel completed the questionnaire after each tactical crossing of the MTAB-L. Over 5200 questionnaire responses were analyzed and categorized by objective.

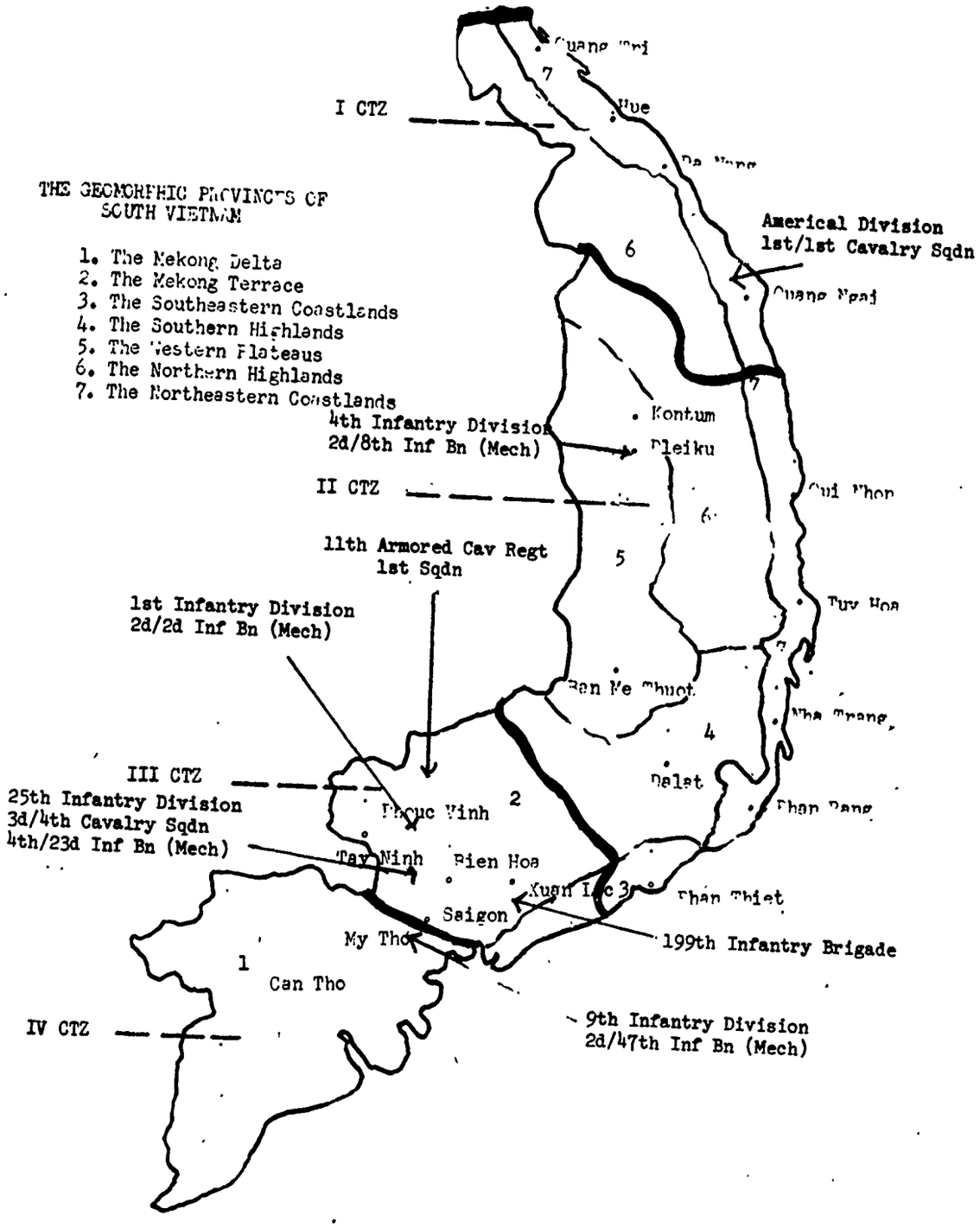

FIGURE 1. Evaluating Unit Locations.

SECTION II

TACTICAL EMPLOYMENT OF THE MTAB-L

10. CROSSING OPERATIONS

a. The MTAB-L was used for crossing rice paddy canals, streams, and ditches with steep banks. It was also placed over destroyed bridge sites or existing bridges which were not strong enough to support armored vehicles. Figures 2 through 7 show a tactical crossing of the Rach Bio River near Tay Ninh by Alpha Company, 4th Battalion, 23d Mechanized Infantry, 25th Infantry Division. On one occasion, the 2d Battalion, 8th Mechanized Infantry, 4th Infantry Division, used two bridges, side by side, to span a destroyed culvert site and re-open Highway 19, the main supply route between Pleiku and An Khe. This double bridge was used until engineers could construct a by-pass.

b. During the evaluation period, 1,867 vehicles crossed obstacles in 106 operations (see Figure 8). The width of the obstacles ranged from 8 to 33 feet. Figure 9 shows the percentage of crossings by width of obstacle.

c. The MTAB-L provided a partial solution to the mobility problems of the mechanized infantry battalions and division cavalry squadrons. The bridge is suitable for use with the M113A1 APC-equipped mechanized infantry battalion. Two units did cross the class 20 M551 vehicle over the class 12 bridge. Although the crossings were successful, the width of gaps during these crossings did not exceed 20 feet. The crossing of any class 20 vehicle over a class 12 bridge is an unacceptable practice.

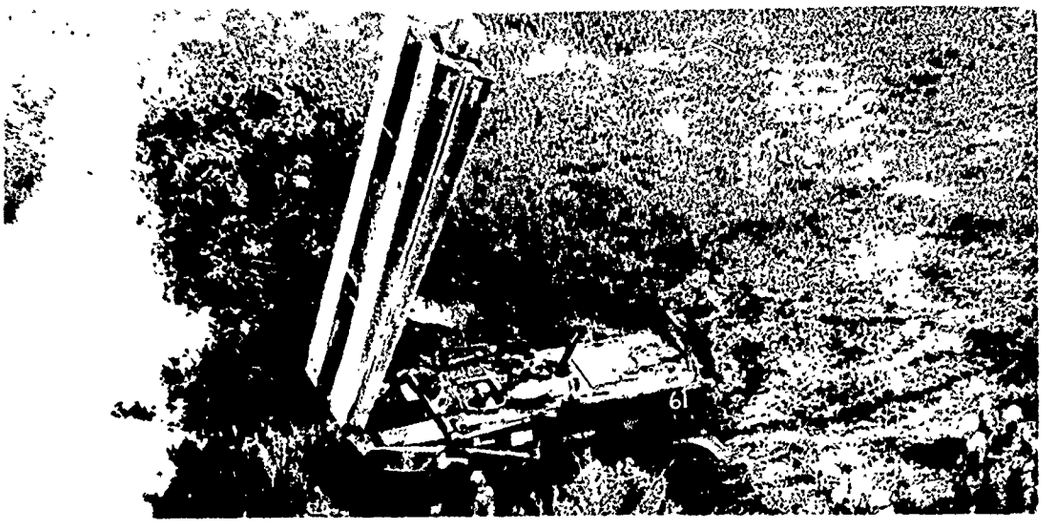

FIGURE 2. Launching of Bridge.

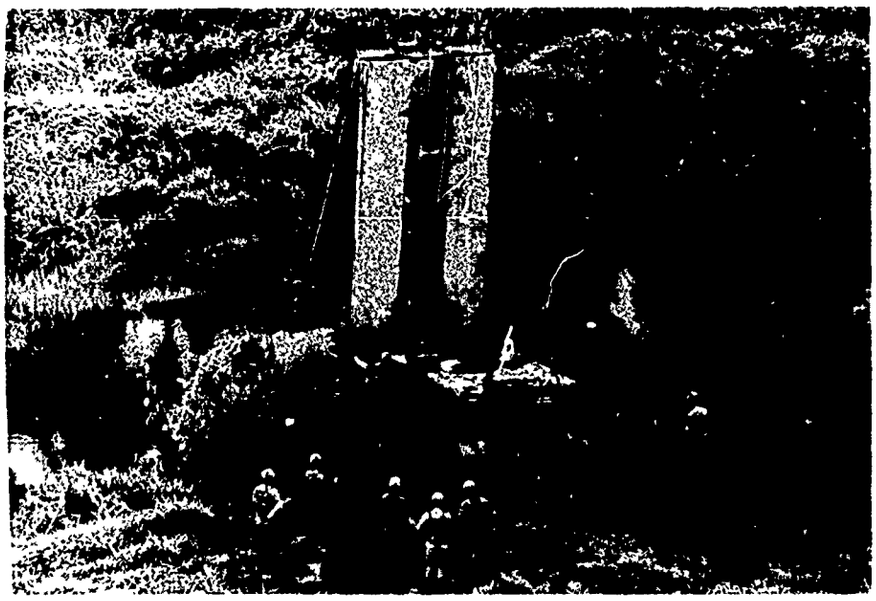

FIGURE 3. Launching of Bridge.

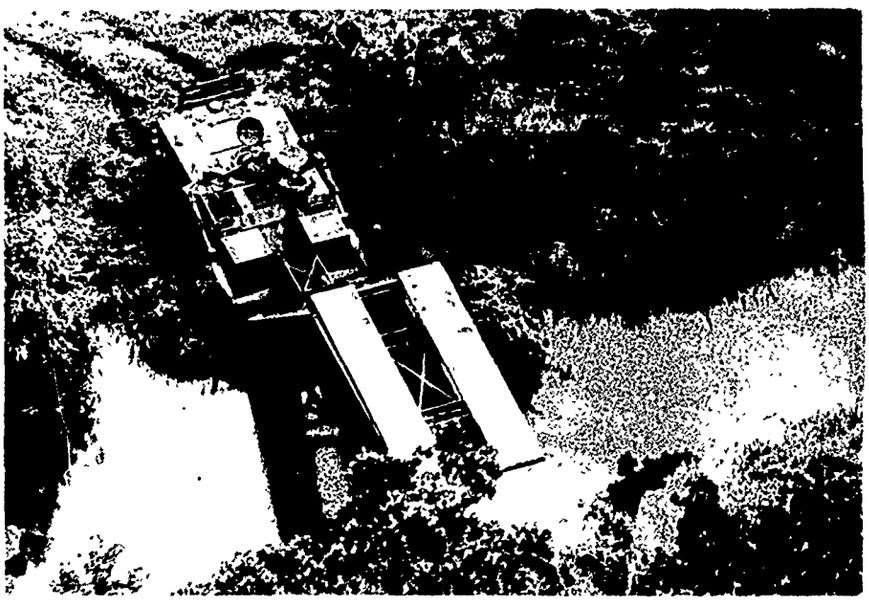

FIGURE 4. Launching of Bridge.

FIGURE 5. Bridge Over River.

FIGURE 6. APC Crossing Bridge.

FIGURE 7. APC on Shore, Soldiers Crossing Bridge.

Unit	Total Number of Crossings	Number and Type of Vehicles Crossing
1st Inf Div 2d/2d Mech Infantry	19	334 APCs
4th Inf Div 2d/8th Mech Infantry	4	18 APCs 4 armored cars 4 5-ton trucks 19 2½-ton trucks 5 3/4-ton trucks 4 1/4-ton trucks
9th Inf Div 2d/47th Mech Infantry	49	882 APCs
25th Inf Div 4th/23d Mech Infantry	9	188 APCs
25th Inf Div 3d/4th Cav	10	152 APCs 38 Sheridans
Americal Div 1st/1st Cav	6	115 APCs
11th ACR 1st Squadron	6	54 APCs 20 Sheridans
199th Light Inf Brigade D Trp/17th Cav	3	30 APCs
	106	1867

FIGURE 8. Tactical Crossings

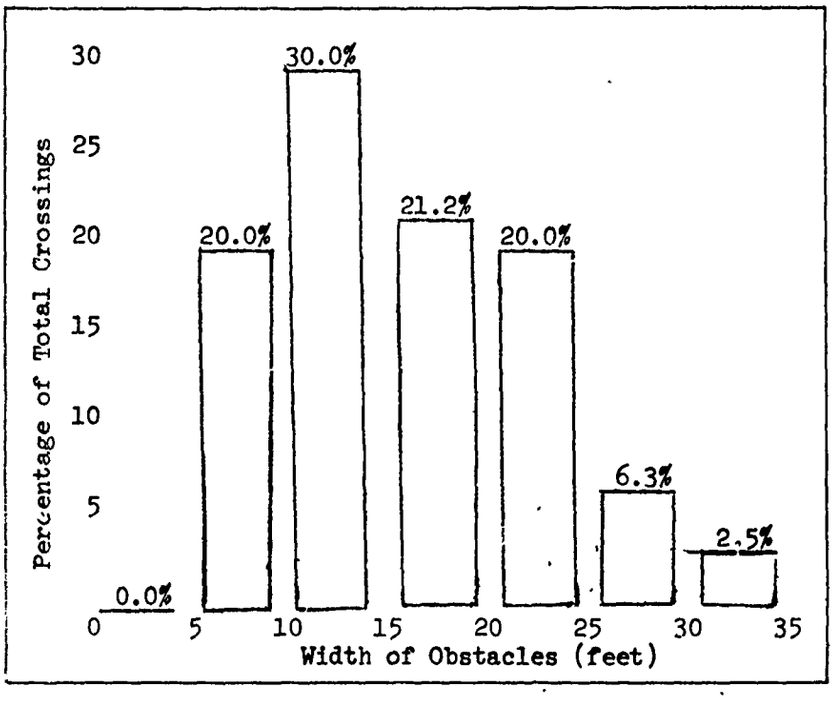

FIGURE 9. Percentage of Crossings by Width of Obstacles.

11. ADDITIONAL BENEFITS DERIVED FROM USE OF MTAB-L

In addition to its primary purpose of bridging marginal terrain, the MTAB-L provided other benefits to the units.

a. Mobility

The MTAB-L allowed units to enter areas of operation (AO) that were previously inaccessible to mechanized vehicles. Factors which prevented entry into some areas of the AO were banks which were too steep and canals which were too wide or too deep. Without a capability for crossing these obstacles, units were forced to turn back or conduct an airmobile operation for deep insertions into the AO. The mechanized infantry battalion and division cavalry squadrons highly praised the MTAB-L concept and agreed that the capability provided the units improved tactical mobility and flexibility of operations in their AO. One evaluating unit increased the coverage of its AO from 60 percent to 85 percent by using the MTAB-L.

b. Vulnerability

The MTAB-L increased the commander's flexibility in choosing crossing points. Before units were equipped with the MTAB-L, crossing points were limited to known sites. These sites were ideal areas to be mined or booby trapped. During April and May 1969, the 2d/47th of

the 9th Infantry Division lost 12 APCs from mining incidents at crossing points. During crossing operations with the MTAB-L, the battalion had no mine incidents.

c. Sustained Operations

Personnel experienced immersion foot when walking in inundated areas. To prevent or reduce foot problems, operations were limited to two days. At the end of the mission, the unit would return to the base camp, stand down, and allow the men to dry out their feet. By using the MTAB-L, the troops could ride on the APCs into areas which previously were accessible only by foot. This allowed the troops to dry their feet, and change socks and boots when necessary. Foot problems were reduced and operation duration was increased from two to five days.

12. OPERATIONAL CONSIDERATIONS

a. The MTAB-L was always positioned toward the rear of the formation during a tactical movement. This was done for two reasons.

(1) The MTAB-L cannot maneuver as well as APCs in densely wooded or vegetated areas. In a column, the vehicles preceding the MTAB-L could clear the path.

(2) The MTAB-L has one .50 caliber machinegun mounted on it. The launcher at the front and the bridge seat at the rear restrict the field of fire of the weapon.

b. When there was a launching operation, APCs had to be positioned to provide security for the MTAB-L.

13. FINDINGS

a. The MTAB-L was employed successfully in 106 crossing operations.

b. The MTAB-L allowed units to enter areas of operation that were previously inaccessible to mechanized vehicles.

c. The MTAB-L was enthusiastically accepted and used in combat operations and was considered a vast improvement over other crossing techniques.

d. The MTAB-L increased the commander's flexibility in choosing crossing points.

e. Foot problems were reduced because troops could ride on APCs into areas previously accessible only by foot.

f. Because of the MTAB-L's limited firepower, the APCs had to be positioned to provide security for it.

SECTION III

OPERATIONAL PERFORMANCE OF THE MTAB-L

14. PROCEDURE FOR CROSSING OPERATION

a. Site Selection

The key to a successful crossing operation was the selection and preparation of adequate launch and retraction sites. If both sites could not meet requirements, the area which had the best retraction site was selected for the crossing. The bridge could be launched under less than desirable conditions, but a firm level base was necessary for retraction.

b. Site Preparation and Bridge Launch

In 75 percent of the crossings, site preparation was required. The preparation varied from leveling a small mound with a shovel and knocking down canal banks to using lumber, pierced steel planking, or M8A1 matting to prepare abutments. In some operations, the crossing site had to be cleared of trees and obstructional debris. Abutment preparation usually consisted of laying the abutment material on a soft bank to distribute the bridge ground pressure when vehicles were on the bridge. The average time to prepare a launch site and launch the bridge was 15 minutes. After the bridge had been launched, a crew member crossed the bridge and prepared the retraction site. The bridge would be raised slightly until the far bank was prepared.

c. Crossing

A company-sized unit consisting of 18 APCs averaged 45 minutes to complete a crossing. The average crossing time was 50 seconds per APC.

d. Retraction

(1) The critical phase of the operation was the bridge retraction. The retraction site must be level and firm if a speedy recovery of the bridge is to be made. The average retraction time was 15 minutes. This included the time to maneuver the launcher into position and mate the locking pins with the pickup bushings.

(2) The 2d Battalion, 47th Mechanized Infantry, 9th Infantry Division experienced considerable difficulty in retraction operations. The majority of obstacles spanned were canals between rice paddies. The dikes consisted of a hard-baked clay surface on top of softer paddy mud. In most cases the dikes were not strong enough to support the weight of an APC on the bridge, and the bridge sank in mud. On five occasions,

the battalions spent several hours retrieving a bridge which had sunk in the mud.

e. Exposure of Personnel

Although MACV stated a requirement that the MTAB-L provide a capability for operation with no exposure of personnel, this was not practical. Accurate positioning of the bridge, site preparation, and vehicle crossing required men on the ground to guide. During retraction, a crewman was required to connect the bridge and the launcher system. No significant enemy contact was encountered during any operation, but some sniper fire was received. There were no casualties.

15. EQUIPMENT PROBLEMS

Throughout the evaluation commanders commended the ease of operation of the MTAB-L. Qualified operators of M113A1 APCs became familiar with the operation of the MTAB-L within hours. The only problems encountered in driver training was the judgment required because of the height of the launcher in the carry position. The basic design of the bridge was adequate to support APC operations, as evidenced by the use of the bridge during the evaluation period. However, problems were encountered with the equipment.

a. Structural Strength

(1) The requirement for swimming capability of the MTAB-L was a major factor in the design of the bridge. Because of the weight restriction to meet swimming capabilities, the structural strength of the bridge had to be reduced. The structural strength greatly affects the ruggedness and weight-bearing limit of the bridge.

(2) None of the units evaluating the MTAB-L had ever conducted an operation which employed the swim capability of the APC. The majority of units removed the APC's swimming capability equipment, such as the track shrouds and trim vane. The interior of the vehicle was stripped to carry additional ammunition and supplies. There is a concern in the units that an APC exposed to concussion by mines, rockets, or mortar fire would not be adequately sealed and would probably leak if employed in a swimming operation.

b. Horizontal Braces

A high failure rate of the horizontal braces was experienced. The horizontal braces are located flush with the bottom of the ramp assembly. The banks of canals between rice paddies were composed of soft mud. The canals were usually from 10 to 20 feet in width. When the bridge was emplaced, there was a 15- to 25-foot overhang on one bank. When the overhang sank into the mud from one to four inches,

the horizontal braces would break. On one occasion, a horizontal brace was broken when the bridge was laid on a rock protruding about two inches above ground level.

c. Bridge Pickups

The lower flange on the bridge pickups was not strong enough. During operations, the units did not always emplace the bridge on level ground. When the operator tried to retrieve the bridge, he could not align the locking pins and the pickup bushings simultaneously with the launcher tongue insertion into the pickups. When this occurred, the launcher tongue had to be used to press down on the pickups to depress the end of the bridge far enough for the locking pins to mate with the pickup bushings. After several operations in which this method of mating the locking pins and pickup bushings was used, the lower flange of the bridge pickups had formed depressions between the supports and the end of the flange was bent. In several instances the flange separated from the pickup.

d. Brace Supports

The supports used to attach the horizontal and vertical braces to the ramp assemblies are welded to the side of the ramp assembly. These supports were broken during operational use and four bridges were declared unserviceable.

e. Friction Pins

The bridge hinge pins, rotating beam pins, clevis pins, and link and cylinder beam pins are teflon coated to eliminate a lubrication point. After approximately five weeks, the pins began to rust. Friction on the pins had eroded the teflon coating. On eight occasions, the bolts holding the rotating beam pin and rotating beam together sheared off due to friction caused by the breakdown of the teflon on the rotating beam pin.

f. Valve Bank Brace

The valve bank braces on five launchers sheared approximately one inch from the end of the brace connected to the valve bank. It was felt that the design of the valve bank support, combined with the motion of the vehicle, caused the support to shear.

g. Launching Cylinder

The power in the launching cylinder was inadequate or marginal when picking up a mud-laden bridge or breaking the suction of the bridge in soft earth or mud.

h. Hydraulic Reservoir Dipstick

The dipstick is a light gray color and the oil in the reservoir is clear. This combination made it difficult to read the dipstick.

i. Bridge Seat Security

When traversing steep terrain, the bridge lifted off the bridge seat. In rough terrain, it bounced on the bridge seat. There was no bridge lock-down capability.

j. Launcher Stability

When the bridge was launched on level ground, the rear of the APC rose approximately 15° off the horizontal. Launching operations at sites which were not level produced hazardous conditions to the vehicle and crew. The addition of outriggers would permit the MTAB-L to be stabilized for the launching operation. Any increase in the weight of the bridge to eliminate other design deficiencies would further aggrevate this problem and may dictate the requirement for outriggers.

k. Roadway Surface

The roadway surface of the bridge was covered with a skid-resistant paint. The paint on the roadway was cracked and peeled when the bridges were uncrated. After the crossing of approximately 100 tracked vehicles, the remainder of the paint had worn away. Mud subsequently deposited on the roadway surface during a crossing operation created a slippery condition which made it hazardous for the vehicles to cross. On 90 percent of the crossings, the vehicles had mud on their tracks. The lack of any curbing added to the hazardous condition.

l. Curbing System

(1) Every unit experienced problems with vehicles sliding on a mud-laden bridge. The MTAB-L has no curb system on the ramp assemblies to prevent vehicles from sliding off the bridge.

(2) The first crossing conducted by the 2d/47th Mechanized Infantry, 9th Infantry Division caused extensive damage to the bridge. An APC crossing the bridge began to slide because of the mud and poor traction. One track slipped off the side of the bridge, and the other track went between the ramp assemblies. The track between the ramp assemblies broke one vertical brace and ripped the brace supports from one side of the ramp assembly. After this incident, the unit fabricated a curb system from 1-1/2 x 1-1/2 x 1/4 inch angle iron (see Figure 10). This system worked for approximately three to four crossings before the welds between the angle iron broke. On another operation, 19 crossings were conducted using 3 bridges. The curb system broke on all three bridges and extensive damage was done to the bridges (see Figure 11).

m. Bridge Ruggedness

(1) The bridge is constructed of a lightweight aluminum alloy and weighs 2750 pounds. The light weight is a desirable characteristic which permits easy manipulation of the bridge and provides a system which is basically compatible with the M113A1. However, the bridge as presently constructed is not rugged enough to withstand hasty crossings in the combat environment of RVN.

(2) Each bridge which had been used in three or more tactical crossings had many small holes and depressions in the roadway surface caused by rocks embedded in vehicle tracks, worn tracks, and tracked vehicles turning on the bridge before exiting the roadway surface (see Figure 12). Damage occurred to ramps on four bridges while the vehicles were maneuvering in rubber tress and dense jungle. The damaged area was the same surface which had been damaged by sliding vehicle tracks. The round housing which encases the pickup bushings at the end of the roadway section collapsed on three bridges. The lip under the pickup bushing was broken off on six bridges when the operators mated the lock pins and the pickup bushings. A high failure rate was experienced with the bridge braces.

n. Crew Protection

The commander's and the driver's hatches could not be opened, or if opened, could not be closed from any position when the bridge was in the carry position. This is an unacceptable situation in an emergency. The .50 caliber machinegun, as presently mounted, affords little protection for the crew. When the bridge was mounted, the machinegun was approximately one foot from the bottom of the bridge in front of the commander's cupola. The machinegun location gave a limited field of fire.

16. FINDINGS

a. Site preparation was required in 75 percent of the crossings, but the average time to prepare a site and launch the bridge was 15 minutes.

b. Bridge retraction was the critical factor in a crossing operation and severely limited the operation of the MTAB-L in mud.

c. The exposure of personnel did not detract from the operational capability or use of the MTAB-L.

d. Minimum training was required for an MTAB-L operator.

e. There were 14 significant problems which dimished the effectiveness of the MTAB-L.

f. The swimming capability for tracked vehicles was never used by the evaluating units in RVN.

Figure 10

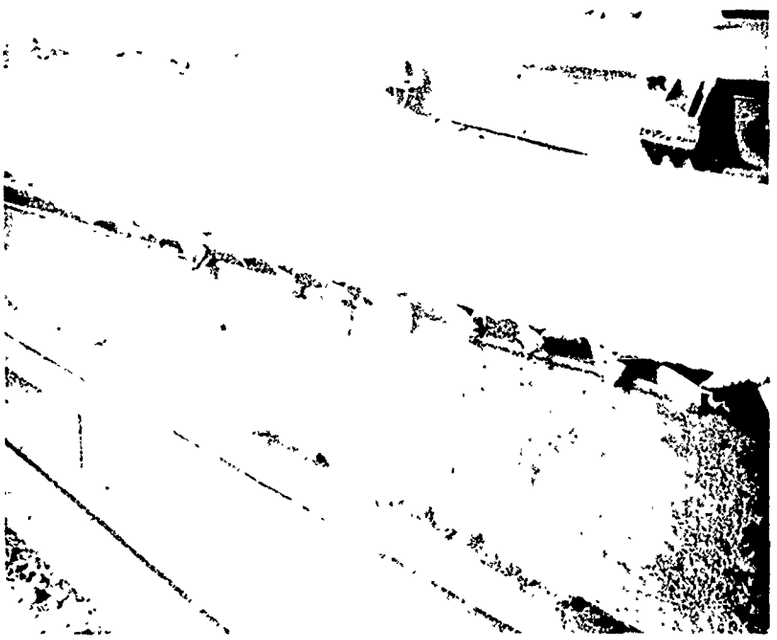

Figure 11

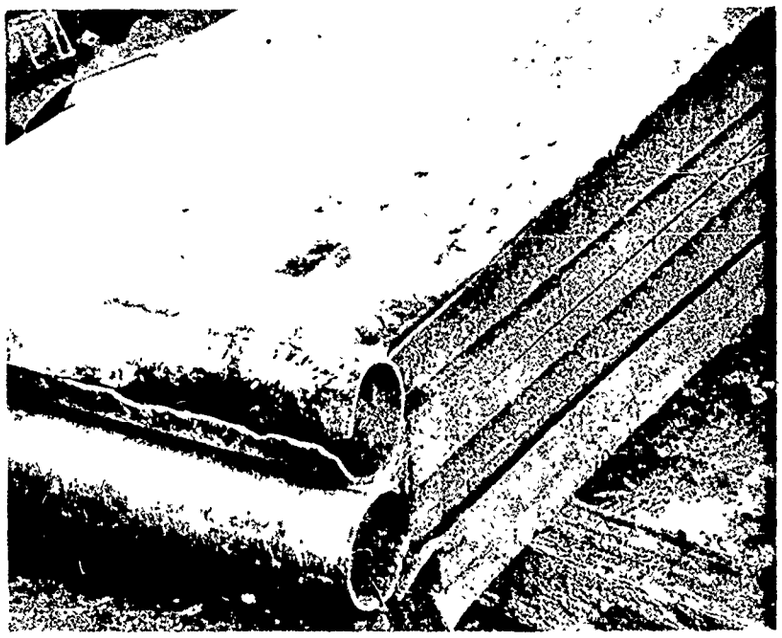

Figure 12

SECTION IV

MAINTENANCE REQUIREMENTS OF THE MTAB-L

During the evaluation no unusual maintenance problems were encountered with the M113A1 APC which could be attributed to the addition of the launcher and bridge to the vehicle. Thus, the maintenance evaluation concentrated on the bridge and launcher system.

17. PARTS USAGE

a. There was no noticeable trend in repair parts usage which would indicate any major defect in design (see Annex A). The only part which experienced a high failure rate was the bridge horizontal brace. These failures resulted primarily from the flush mounting of the brace to the bridge ramps.

b. The 9th Infantry Division had a high parts failure rate compared with the other evaluating units. After 44 days, the 4 bridges assigned to this unit were inoperative. The NETT and operators from the 9th Infantry Division cannibalized the four bridges and were able to provide one operational system. The reasons for the high failure rate in the 9th Infantry Division were rough environment of the Delta and the accidents caused by the poor vehicle traction and the absence of a curb system on the bridge during crossing operations in muddy terrain.

18. MAINTENANCE REQUIREMENTS

The design of the bridge and launcher permitted maintenance to be accomplished at the organizational level. Exceptions were the repair of the bridge folding cylinder, locking cylinder, launching cylinder, hydraulic pump, valve bank, and pressure relief valves. These items, however, were requisitioned end items and were replaced by organizational maintenance personnel. The faulty parts were turned in for repair at a higher maintenance level. During the evaluation, all parts replaced on the bridge and launcher were replaced at unit level. There were two unacceptable maintenance problems encountered during the evaluation. Both of them resulted from the aluminum alloy construction of the bridge. The first unacceptable maintenance area was that associated with the welding requirements of the aluminum alloy. Damage to the bridges as a result of accidents required three bridges to be declared unserviceable because the welding requirements could not be met in the field. The second problem involved the maintenance needed to repair holes in the bridge roadway surface. While no bridge was declared unserviceable during the evaluation because of holes and/or depressions in the lightweight aluminum roadway surface, it is believed that major maintenance problems would result over extended use of the bridge.

19. TOOLS

The tools available in the OEM, with few exceptions, proved adequate for maintenance of the system. Additional tools required are as follows:

a. Oil can, 4-quart pour type for filling hydraulic reservoir.

b. Ratchet, 1/2-inch drive for tightening of nuts and bolts, securing the link beam, cylinder beam, and hose retractor beam supports.

c. Allen wrench, 1/8-inch for tightening the set screw in the retainer plate.

20. MAINTENANCE SUPPORT DURING EVALUATION

a. Sufficient quantities of repair parts were not available to provide support at each location at which the systems were deployed. The parts were located at Long Binh and distributed to the units by the project officer on an as-required basis. All repair parts needed during the evaluation were available in the maintenance package with the exception of one link beam. The link beam was damaged in an accident and not through normal wear.

b. The procedure for centralized control and distribution of repair parts was used to reduce equipment downtime during the evaluation. With the exception of the welding problem, it was felt that logistic support of the system could be accomplished through normal supply and maintenace procedures if the MTAB-L was a standard A item.

21. FINDINGS

a. There were no noticeable trends in repair parts usage which would indicate any major defective part.

b. With the exception of welding and roadway surface repairs of the bridge, the MTAB-L can be maintained with relative ease by using normal logistic procedures if the MTAB-L was a standard A item.

c. The tools available in the OEM, with three exceptions, were adequate to support the system.

SECTION V

BASIS OF ISSUE FOR EACH TYPE EVALUATING UNIT

22. BASIS OF ISSUE

a. Throughout the evaluation one MTAB-L proved adequate to support the tactical operation of a mechanized company or a cavalry troop. Consolidation of assets at battalion level was used in some units to support the battalion operations. However, the allocations from battalion were usually on a basis of one per company.

b. The major problems encountered during the evaluation were those associated with units in which the MTAB-Ls were not assigned directly to the companies or troops using them. When the MTAB-L was not assigned to the unit, the operational and maintenance problems and limitations in employment of the bridge were not appreciated, accepted, and understood by the supported commanders. On the contrary, when the bridge was assigned to a company or troop, the maintenance was better and the tactical employment of the bridge was enhanced.

c. An ACTIV evaluation of the Optimum Mix of Armored Vehicles for use in Stability Operations will be conducted in January and February 1970. This evaluation will determine the basis of issue of all tactical bridging required by all types of armored units in RVN.

23. FINDINGS

a. Units operating in tactical areas of operation which had many small obstacles such as canals and ditches could be supported by one MTAB-L per company or troop.

b. The tentative basis of issue of the MTAB-L in RVN is one per line company of the mechanized infantry battalion and one per line ground troop of the divisional cavalry squadron. The basis of issue of tactical bridging for armored units in RVN will be addressed in the ACTIV evaluation of the optimum mix of armored vehicles in stability operations.

SECTION VI

CONCLUSIONS AND RECOMMENDATIONS

24. CONCLUSIONS

a. There is a valid requirement for the MTAB-L in RVN.

b. The basic design of the MTAB-L is adequate to support APC-equipped units. The MTAB-L was not designed to support a class 20 load.

c. The addition of the MTAB-L to mechanized infantry battalions, division cavalry squadrons, and separate brigade cavalry troops greatly improves the tactical mobility and flexibility of these units in RVN where many small canals, streams, ditches, understrength bridges, and other types of gaps create obstacles to mechanized operations.

d. Minimal training is required to train a qualified MTAB-L operator.

e. There is no requirement for the MTAB-L to have a swim capability in RVN.

f. There are 14 design problems in the MTAB-L.

g. The bridge, as designed, is not rugged enough for sustained tactical operations in RVN.

h. With the exception of repairs of the roadway surface and structural failures, the MTAB-L can be supported through normal logistical procedures.

i. There was no noticeable trend in repair parts use during the evaluation which would indicate any defective type parts.

j. A mechanized infantry company or a divisional armored cavalry troop can be supported on the basis of one MTAB-L per mechanized infantry company or cavalry troop.

25. RECOMMENDATIONS

It is recommended that:

a. The bridge be made more rugged to withstand the sustained operations of an RVN environment.

b. Curbing be provided on the bridge.

c. An improved roadway surface be provided for improved traction during crossings under wet and muddy conditions.

d. Additional power be provided for bridge pickup in wet and muddy crossing sites.

e. Lifting eyes be provided to expedite bridge pickup in muddy terrain.

f. Consideration be given to provide outriggers in order to stabilize the launcher during bridge launching and retraction operations.

g. The horizontal braces be relocated to eliminate vertical load bearing.

h. The bridge pickup flanges be strengthened.

i. The teflon coating on the friction pins, i.e., the bridge hinge pins, rotating beam pins, clevis pins, and link and cylinder beam pins, be removed and replaced with a lubrication joint or other improved lubrication technique.

j. The valve bank braces be relocated to prevent damage.

k. Better protection be provided for the hydraulic lines.

l. Crew protection be improved by redesign of the driver's and commander's hatches which will allow them to be opened or closed while the bridge is in the traveling position. An improved armament system is also desirable.

m. The hydraulic reservoir dipstick be modified for easier readings.

n. A method be provided to secure the bridge in the traveling position.

o. The brace supports be bolted to the ramp assembly for easy replacement when broken.

p. The M113A1 be retained as the transporter/launcher for the MTAB-L and that the swimming capability of the M113A1 with loaded bridge be eliminated in RVN.

q. The MTAB-L be redesigned to support tactical vehicles up to a class 20 type, specifically the M551 Sheridan.

ANNEX A
REPAIR PARTS USAGE

Repair Part	Reason for Use
	1st Infantry Division, 2d/2d Mech Inf
Cylinder, folding FSN 5420-880-2730	Cylinder developed leak due to a warped shaft.
Brace, horizontal FSN 5420-880-2647	Accident
Brace, vertical FSN 5420-880-2639	Accident
Brace, vertical FSN 5420-880-2646	Accident
Pickup FSN 5420-880-2648	Damaged in operation. See Section II.
Plug, quick disconnect FSN 5420-880-2955	Accident
	4th Infantry Division, 2d/6th Mech Inf
Plate, retainer FSN 5420-880-2615	Part worked loose and was lost on operation.
	9th Infantry Division, 15th Engineer Battalion
Valve bank FSN 5420-880-2809	Using unit adjusted pressure to 5000 psi. Valve bank split and braces were sheared.
Brace, vertical FSN 5420-880-2639	Track slipped into center of bridge and broke brace. There were four occurrences.
Brace, vertical FSN 5420-880-2646	Track slipped into center of bridge and broke brace.
Link, tensile FSN 5420-880-2719	Unit did not release pressure on folding cylinder during pickup of mud-laden bridge. There were three occurrences.
Plug, quick disconnect FSN 5420-880-2955	Track slipped into center of bridge and broke brace. There were three occurrences.

Repair Part	Reason for Use
Socket, quick disconnect FSN 5420-880-2863	Track slipped into center of bridge and broke brace.
Hose assembly FSN 5420-880-2849	Damaged when track backed into a tree.
Hose assembly FSN 5420-880-2850	Track crossing bridge dropped a .50 caliber ammunition can on hose.
Brace, horizontal FSN 5420-880-2647	Small deflection in brace. Then vibration in transit caused it to break.
	25th Infantry Division, 4th/23d Mech Inf
Brace, vertical FSN 5420-880-2646	Accident
Pin, lock FSN 5420-880-2955	Accident
Pin, lock FSN 5420-880-2955	Damaged when operator did not release pressure and tried to back away from bridge.
Pin, lock FSN 5420-880-2598	Worked loose and was lost on operation.
Socket, quick disconnect FSN 5420-880-2863	Accident
Socket, quick disconnect FSN 5420-880-2863	Damaged when operator did not release pressure and tried to back away from bridge.
	Americal Division, 1st Squadron/1st Cavalry
Cylinder, launching FSN 5420-880-2728	Cylinder leaked around lock ring.
	11th Armored Cavalry Regiment
Adapter, tee FSN 5420-880-2864	Tee damaged in jungle when vines caught on it and broke it. There were two occurrences.
Brace, horizontal FSN 5420-880-2647	Accident

Organizational maintenance was required on all repairs listed here.

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13. ABSTRACT

The Army Concept Team in Vietnam evaluated the Marginal Terrain Assault Bridge Launcher (MTAB-L) to determine its suitability in the combat environment of RVN.

The MTAB-L has two basic items, a bridge and a launcher both mounted on an M113A1 APC. The bridge consists of two extruded flat aluminum treadway sections which fold at the center. It is designed to support class 12 loads and has a span of 33 feet. The launcher is welded to the hull of the APC and hydraulically emplaces and retracts the bridge.

The evaluation period started on 3 June 1969 and ended on 10 September 1969. Twenty MTAB-Ls were used in this evaluation. A total of seven units participated in the evaluation and these units were located throughout RVN.

The MTAB-L provided an obstacle crossing capability to the mechanized infantry battalion and the divisional cavalry squadron. By using the MTAB-L, the above type units were able to cross the many small streams and canals located in their areas of operations much faster than they had crossed before using field expedient techniques. The evaluation revealed defects in the design and ruggedness of the bridge.

The evaluation concluded that there is a valid requirement for the MTAB-L in RVN and it increases the tactical mobility and flexibility of the mechanized infantry battalions and divisional cavalry squadrons.

From this evaluation, it is recommended that the bridge be made more rugged, a curb system be provided, the class of the bridge be increased and that certain features be improved.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Marginal Terrain Assault Bridge Launcher						
M113A1 Armored Personnel Carrier						
MTAB-L						